



Elizabeth Hennessy

ON THE BACKS OF TORTOISES

Darwin, the Galápagos, and the
Fate of an Evolutionary Eden

Teaching Guide

PRE-READING QUESTIONS AND ACTIVITIES

1. Before you begin reading *On the Backs of Tortoises*, reflect on what conservation looks like to you. What does conservation mean? Who or what does it serve? Have you ever been a part of conservation efforts?
2. Write a short reflection on a memorable experience you have had with nature. This could be anything from an animal encounter, to a favorite nature spot, to a trip to a National Park. Describe the area or experience. Why is it significant to you? How does it make you feel?
3. Name five charismatic endangered species. Why are they endangered and what are conservationists doing to protect them? What makes them charismatic?
4. What previous knowledge do you have of Charles Darwin? What knowledge do you have of the Galápagos Islands? Where did you learn this information?
5. What stories or fairy tales come to mind when you think of turtles and tortoises? What messages do these convey about these animals? About human relationships with the natural world?
6. Search for the Galápagos on Instagram or Google Images. What types of photos do you see? Are certain animals or places in the archipelago represented more than others? Based on your search, why do you think people come to visit the islands? What would you expect to see if you visited?
7. Compare the two maps at the beginning of the book (pp. xvi-xix). What information do these maps convey? What patterns do you see?

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CHAPTER 1: WHAT WE STAND ON

Questions

1. In Western culture, we often imagine nature to be a place untouched and unmarked by humans. Why are people attracted to the idea of studying and visiting a place untouched by humans? Why is this a false ideal?
2. What is the significance of the “turtles all the way down” story? Why do you think Hennessy references it multiple times?
3. Reflect on the concept of a “natural laboratory.” What do you think the significance of this phrase will be for managing the Galápagos? What other places might be considered natural laboratories? How are they managed?
4. How do the climate and geological conditions of the Galápagos make it unique? How do these conditions impact the archipelago’s inhabitants, both human and nonhuman? Do they impose limitations? Do they allow for freedom?
5. Why are some species (like the Galápagos tortoises) more popular or “charismatic” than others? How does this impact human efforts of conservation for their species? How does it impact conservation efforts of species that are not deemed “charismatic” (like insects)?
6. Hennessy writes, “Our foundation for knowledge is shaped as much by where we stand as by what and who stands around us” (p. 11). Who and what stands around the tortoises of the Galápagos Islands? How do these environmental players influence what we know about the archipelago?

CHAPTER 1: WHAT WE STAND ON

Activities

1. Visit the Charles Darwin Foundation’s [Galápagos Species Checklist](#) and search for Endangered or Critically Endangered species. Pick a species and research what conservation efforts are being made to protect it. Is there any controversy over the protection of that species? Why or why not?
2. Read the article “[Human-induced evolution caused by unnatural selection through harvest of wild animals](#)” by Fred. W Allendorf and Jeffrey J. Hard in the *Proceedings of the National Academy of Sciences*—especially the section “History of Unnatural Selection.” What stands out to you in this article? How are humans affecting the evolution of other species?
3. Watch Part 2 of the BBC [documentary](#), “Galápagos: The Islands that Changed the World.” Choose a species featured in the documentary and describe how evolution has shaped that species. How does the history of Galápagos continue to shape its future?
4. Read the [article](#) “TEDxGalápagos tells the story of Galápagos’ humans” by Jessica Gross. How does this event portray a different story about the islands than that shown in the nature documentary? Who are the people affecting the Galápagos? How do their stories and opinions shape the islands?
5. Visit the website of the [Galápagos Conservancy](#). What is the message of conservation from this website? What are they promoting? What information is not present? Is there an inequality between conservation efforts of different species? How does this speak to human opinions on the value of these species? What does it mean that a United States-based NGO has the rights for the domain [www.Galápagos.org](#)?
6. Design your version of the ideal natural laboratory. Think about these factors when designing your laboratory:
 - How much space does your laboratory require?
 - What species will your laboratory house and study?
 - What types of scientists will the laboratory employ? (For example, biologists, animal scientists, botanists?)
 - Who will have access to the laboratory?
 - Will tourists, locals, and members of the press be allowed in the area?
 - How will the laboratory and its research be funded?

CHAPTER 2: IN DARWIN'S FOOTSTEPS

Questions

1. What is an “ecotourism bubble”? What role do the images in a Google Image search or a nature documentary (like the BBC Documentary “Galápagos”) play in constructing it?
2. Hennessy writes that many monuments to Darwin exist on the islands, and that he is portrayed as “god-like.” Why do you think he is depicted in this way? Do you think that he should be so revered in the islands? Why or why not?
3. This chapter explored two versions of Charles Darwin: the familiar image of the naturalist and father of evolution versus the young, British adventurer, engaging in activities that would now be deemed inexcusable (for example, riding and eating tortoises). Does this change your opinion of Darwin? How does this behavior shed light on the shift in ethics from then to now?
4. How have people’s motives changed when visiting the Galápagos over time? What were they hoping to gain from their visits in the 1800s? What do people hope to gain now? How has the “take away” changed over time?
5. What impacts did the whaling industry of the mid-1800s have on the Galápagos Islands and tortoises?
6. Compare the value associated with the tortoises when Darwin arrived on the islands to the value they hold for tourists visiting the islands now. How have human interactions with the islands’ environment changed?
7. Without the accounts and narratives of previous voyagers that were passed on to travelers, do you think the Galápagos Islands would be what they are today? How did these narratives and accounts shape travelers’ expectations of the Galápagos? How do these expectations persist today?

CHAPTER 2: IN DARWIN'S FOOTSTEPS

Activities

1. Host a classroom debate of this statement: "The image of Charles Darwin is glorified for the purpose of generating profits."
2. Watch the short National Geographic video called [Darwin in the Galápagos](#). Compare the portrayal of Charles Darwin in this video to Hennessy's portrayal of Darwin. What similarities and differences do you see in these depictions?
3. Read the May 15, 1847 excerpt from the newspaper *The Friend* "[Gallipagos Islands—No. 2.](#)" Complete a short primary document analysis by answering the following questions:
 - Who was the author of the document?
 - Who was the intended audience?
 - When and where is this source from?
 - What was the main message of the document?
 - What was the author's purpose for writing the document?
 - What was happening around this time in history?
 - What were you able to learn from this document that you might not have learned anywhere else?
 - What other historical sources could you use to better contextualize this document?
4. Compare maps of the Galápagos by [James Colnett](#) (T. Foot & A. Arrowsmith, London, 1805 [1798]) and [FitzRoy's HMS Beagle](#) (1836, with additions to 1926) to each other and to the maps at the beginning of the book. How have depictions of the archipelago changed? As Hennessy writes, early modern sailors often thought islands floated and thus could shift position. How did this impact sailors' navigation and maps? If you were an explorer with only these maps and narrative accounts, how might that impact your journey? [For other maps, see historian [John Woram's collection](#).]
5. Read Darwin's [chapter on the Galápagos](#) from his *Journal of Researches* (pp. 372-401). Why did he find the archipelago so interesting? What animals was he particularly interested in? What experiences did Darwin have with them, and how have the ethics of animal encounters and experiment changed (or not)?
6. Read the second sketch from Herman Melville's *Las Encantadas*, "[Two Sides to a Tortoise.](#)" For Melville, what do the two sides of the tortoises represent? What do you make of his "wild nightmare"?

CHAPTER 3: WHAT'S IN A NAME?

Questions

1. What is a living fossil? What is the significance of Galápagos tortoises as living fossils? How does this relate to the idea that the Galápagos is an “evolutionary Eden”?
2. What were Darwin, Günther, and Baur’s theories about how tortoises arrived in the Galápagos? What reasoning and evidence did they provide for their theories?
3. For sailors venturing onto the islands, the land was treacherous and almost uninhabitable. Do you think this difficult terrain provided some protection for tortoises?
4. What did it mean to “save” tortoises in the late nineteenth and early twentieth centuries? How do these efforts differ from how we think of saving species today? Are there any similarities? How has conservation changed over time?
5. As discussed in this chapter, many tortoise species on the Galápagos Islands were named after the explorers and naturalists that studied them. Hennessy describes this as a reflection on imperialism and Western understandings of nature. Why? What do you make of her interpretation? If you discovered a species, how would you approach naming it?
6. Explain the distinction Beck drew between islanders’ hunting and his own capture of tortoises. Do you believe his actions were justified?
7. Beck’s photo of the broken tortoise carapaces (p. 69) helped spark conservation efforts in the Galápagos. If a less charismatic species was photographed, do you believe it would have created the same reaction? Historically, can you think of any examples of animals that have garnered a similar (or dissimilar) reaction?

CHAPTER 3: WHAT'S IN A NAME?

Activities

1. Create a timeline detailing the arrivals of the various naturalists and explorers that visited the islands.
2. Visit [the American Museum of Natural History's page on Galápagos tortoise evolution](#) and look at the different shapes of tortoise carapaces. From an evolutionary perspective, how have tortoises physically adapted to live on specific islands on the archipelago? What unique functions do their carapaces and other features serve?
3. Imagine you are a tortoise on the Galápagos Islands. Write a short story about your experiences with Beck and other naturalists. What do you see? What do you do? How do you feel? Have a classroom discussion on the merits and problems of anthropomorphism and anthropocentrism.
4. Pretend you are a naturalist at the turn of the twentieth century. Using only information available at the time, debate this statement: "The tortoises arrived to the Galápagos via land bridge."
5. Imagine that you are naturalist in the early 1900s, and you have been tasked with a saving Galápagos tortoises. What factors would you consider? What resources would you require? What regulations would you implement? If this conservation plan had been implemented, what changes in the tortoise population would you hope to see now?
6. Compare Lonesome George and Specimen 8109. What similarities and differences do you see in how scientists use(d) and value(d) the two tortoises? Create a Venn Diagram to plot your answers.
7. Hennessy wrote this chapter around the names of four tortoise species. Pick another species of tortoise (or any species) from the Galápagos and trace its history.

CHAPTER 4: THE MANY WORLDS AT WOLRD'S END

Questions

1. Hennessy writes about a monument to Charles Darwin created by Victor Wolfgang Von Hagen. What was his intention in creating the monument? What message do you think the monument sends to tourists?
2. "The Many Worlds at World's End" illustrates the distinct historical roles the Galápagos has held. What different versions of the Galápagos do we see represented in this chapter? Who were the major players in the development of these varying visions of the islands?
3. Colonization of the Galápagos was premised on desire to exploit the archipelago's resources. What were these resources, and who sought to profit from them at different times?
4. How does the colonization of the Galápagos compare to other examples of 19th century colonialism?
5. What were the environmental consequences of cattle ranching and sugar cane plantations in the Galápagos? What were the consequences for laborers of the way these industries were organized?
6. How did the settler colonies differ in their understanding of nature? What did the different geographical imaginations of the islands (as deserted, as agricultural penal colonies, as an evolution laboratory) have in common? What do these commonalities reflect?
7. What does the story of the "Robinsons" tell us about why the Galápagos Islands were appealing to some European and North American settlers?
8. The Galápagos Islands are often referred to as a "natural laboratory", which eludes to nature as the experimenter. Compare "nature experimenting" and the experiments of human scientists. What differences and similarities exist can you find? What are the benefits and drawbacks of each type of experimenting?
9. What were the main economic industries of the Galápagos? How did they affect the lives of the local people?

CHAPTER 4: THE MANY WORLDS AT WOLRD'S END

Activities

1. This chapter depicts multiple parties that valued and used the Galápagos. Create a list of these parties and what they found valuable about the Galápagos.
2. Patrick Watkins, the first known inhabitant of the Galápagos, was an Irish sailor who deserted his ship and stayed on Floreana for many years. Imagine you are in his position. What would you have to do to survive? Write a story about your first month on the island, or write a reflection comparing Watkins' story to the tale of Robinson Crusoe.
3. Create a timeline of important events described in this chapter in the history of the Galápagos Islands. Include 6-8 events and a short explanation as to why each event affects the fate of the Galápagos. Describe their significance to conservation, the economy, or scientific discovery. Create a chart or Venn Diagram connecting these events to the groups you described in Activity #1.
4. Visit a local zoo and observe the tortoise exhibit. Sketch the exhibit. What does this habitat look like? What were the visitors doing? What does a typical tortoise's habitat look like in the wild? Can you relate this exhibit to Lonesome George? How did you feel when you saw the tortoises?
5. Imagine you are a naturalist who visited the Galápagos in the decades after Darwin did. Choose the year of your visit, between 1835 and 1940. How would you describe the islands and social life there? Be sure to include important facts about the region, including species, natural resources, and human settlements that you encountered.
6. You are a former worker on the San Cristóbal sugarcane settlement headed by Manuel Cobos beginning in 1879. After two of your fellow workers kill Cobos due to his brutality in 1904, the government attempts to also hold you and all the other workers responsible. On behalf of the entire settlement, you are asked to speak before government authorities and convince them that no one but the two killers deserve to be punished. Using your experience as a worker under Cobo's rule, as well as a past history of injustice towards penal colonies headed by Villamil and naval captain Jaime Williams, make your case for innocence.

CHAPTER 5: MAKING A NATURAL LABORATORY

Questions

1. How did conservation on the Galápagos become an international affair? What organizations played a role in conservation on the islands?
2. Who were Robert Bowman and Irenäus Eibl-Eibesfeldt and what was their significance in species conservation on the islands?
3. What was the goal of the development of a research station? Different organizations and actors had different goals for this station and how it should be managed. What were they? What were the challenges of creating this station? How did foreign scientist's goals for the archipelago differ from those of Ecuadorian scientists?
4. Why did tourism become a major strategy for the preservation of the Galápagos?
5. What mental images or feelings do the phrases "natural laboratory" and "geographical imagination" invoke? How do these images and feelings both positively and negatively frame conservation efforts on the Galápagos?
6. Conservation and development for tourism are often seen as competing forces, when in reality, they can both work for the benefit of the islands. How do conservation efforts and tourism developments interact on the Galápagos, and what are some of the positive impacts of these two forces?

CHAPTER 5: MAKING A NATURAL LABORATORY

Activities

1. On notecards or Post-Its, write down any key terms you don't understand or any questions you have about the chapter. As a class, categorize the terms and questions. Then, work together to answer the questions, define the terms, and map out how the topics relate to each other on the board.
2. Use your book to find phrases and descriptions that Western scientists such as Bowman and Eibl used to describe the Galápagos. Pretend that you are an American citizen in the 1950s and these descriptions are the only perspective you have on the Galápagos. What are your impressions of conservation and scientific efforts on the islands?
3. Imagine you are a young researcher in the early 1950s like Bowman or Eibl who visits the Galápagos and is concerned about the fate of wildlife. What would you do?
4. Imagine you are a scientist in the late 1950s and are invited to be part of the board of the new Darwin Foundation for the Galápagos Islands. As a board member, your job is to plan and coordinate the conservation of the islands and the new Darwin research station. What would your priorities be? What factors would you consider? Would you promote tourism as Bowman and others did?
5. Peter Bowler's book [*Darwin Deleted: Imagining a World Without Darwin*](#) (University of Chicago Press, 2013) explores where the world would be now without Darwin's theory of evolution. Think about a world where Darwin never stepped foot on the Galápagos Islands. How would conservation efforts on the islands look? Would they be conserved? Would there still be major scientific interest in the islands? Create a list of events on the island that would never have occurred without Darwin. Then, draw an image of the islands in this alternate universe.

CHAPTER 6: RESTORING EVOLUTION

Questions

1. What are examples of cross-species cooperation and cross-species antagonism in the Galápagos? Why were these relationships important to the mission of conservation?
2. Animal control and breeding programs are some examples of conservation biopower. What does this mean? (Hint: See p. 149 and p. 255, Notes 10 and 11.) What other examples does Hennessy discuss? What other examples can you think of outside of the Galápagos? What are the ethical and moral stakes of this kind of management?
3. What roles have introduced animals played in Galápagos ecosystems? How and why were they introduced? What was their impact for people and for the environment?
4. After reading this chapter, have your views on conservation or restoration ecology changed? How would you judge the efforts to eradicate “invasive” populations, to conserve tortoise and plant populations, and to “restore Eden” on the islands?
5. After reading this chapter, has your understanding of the “natural laboratory ideal” changed the way you think of species purity? What are some ethical implications and ecological effects of trying to conserve species purity?
6. After evaluating conservation and restoration efforts, do you believe it is responsible to frame restoration efforts as attempts to return ecosystems to their state in a previous time period? Why or why not? If so, to which time period should it be restored? Is this a feasible goal?

CHAPTER 6: RESTORING EVOLUTION

Activities

1. Before you read this chapter, write a short paragraph about what you know about restoration ecology and species conservation. What are some examples of restoring damaged ecosystems and endangered species? How do scientists work to achieve conservation and restoration?
2. Imagine that you are a conservation biologist, and you have been tasked with the creation of a restoration plan for the remaining Galápagos tortoises. What factors would you consider? What resources would you require? What regulations would you implement? If this conservation plan had been implemented, what changes in the tortoise population would you hope to see in the future?
3. Think-pair-share: Brainstorm individual “celebrity” animals (for example, Flipper). Why are they famous? How are they similar to or different from Lonesome George or Diego?
4. Do a primary source analysis of the [Atlas of Project Isabela](#). What do you learn about the rationale for eradication and the culture of eradication-based conservation?
 - Who authored the document?
 - Who was the intended audience?
 - When and where is this source from?
 - What was the main message of the document?
 - What was the author’s purpose for writing the document?
 - What was happening around this time in history?
 - What were you able to learn from this document that you might not have learned anywhere else?
 - What other historical sources could you use to better contextualize this document?
5. Create your own plan to control the goat population on Pinta Island. How might you prevent contraband goats from returning to the island? How can you effectively manage the population?
6. Draft a letter to an international organization of your choice to request funding for conservation efforts in the Galápagos. What organization would you reach out to? What conservation plan would you pitch? What arguments would you use about the importance of conserving the archipelago?

7. A. Create a conservation plan for a species that is currently endangered. Consider factors such as budget, habitat, support from local and international organizations, and labor required. Would you consider invasive species that harm the animal you are trying to conserve? Would you harm other animals to save your animal? How would you consider the lives of humans and how they interact with your animal? How will the location of your animal's habitat impact your plan?

B. Write a reflection on the experience of creating a conservation plan. What were the challenges of creating this kind of plan? What were the strengths of your plan? What could you improve on? Compare your plan to the conservation efforts for tortoises in the chapter. What succeeded in their plans? What failed?

CHAPTER 7: LABORATORY LIFE

Questions

1. In this chapter, Hennessy discusses the Socio-Ecological Systems (SES) model. What are the key points of this model? What are the pros and cons of using it to analyze the Galápagos? Who advocated for the model and why? What are Hennessy's criticisms of it?
2. What does Hennessy mean by the phrase, "a new laboratory"? How does this idea of socio-ecological conservation differ from historical beliefs about the island that are mentioned in the SES Model?
3. How does Campo Duro represent a new approach to managing life in the Galápagos? How does it differ from cruise-based tourism?
4. Hennessy states that "tortoises are boundary objects" (p. 198). What does she mean by this? Discuss the idea of a boundary object and how it relates to tortoises.
5. Hennessy discusses her own personal experience attaching GPS trackers to Galápagos tortoises. What are the benefits of GPS tracking? What are the moral and ethical concerns regarding this practice?
6. In 2002, biologists published a "Biodiveristy Vision" with the goal of returning the Galápagos to their state in 1534. Why? What were the social implications of this vision? Why did conflict arise when focusing on preserving the "pristine nature" of the Galápagos? How would the socio-ecological concept of conservation solve this conflict?
7. How do the socio-natural transects and the alternative tour sites Hennessy discusses in this chapter present an alternative view of the Galápagos life than what tourists see on cruises?

CHAPTER 7: LABORATORY LIFE

Activities

1. Create an agenda for a tour of the Galápagos Islands. What would you include? What would you share with the tourists? Is there any historical (or modern) information you would purposefully exclude? How would you incorporate conservation into your tour? Would it be free? If not, what would you do with the profits?
2. Visit a local zoo and observe the tortoise exhibit. Sketch the exhibit. What does this habitat look like? What were the visitors doing? What does a typical tortoise's habitat look like in the wild? Can you relate this exhibit to Lonesome George? How did you feel when you saw the tortoises?
3. Watch [Part 3](#) of the BBC Documentary "Galápagos". What impacts have humans had on the Galápagos tortoises? Compare this reality to the perception of the Galápagos as an untouched land. In what ways are the portrayals of the Galápagos by Hennessy and the documentary similar? In what ways are they different?
4. Do some research on Camp Duro. Search their website and watch Youtube videos to develop your understanding of their mission and what their land looks like. What is their main mission? What did you learn about the Galápagos or conservation efforts?
5. Read the *New York Times* article, "[Is Land Tourism Threatening the Galápagos?](#)" What are some problems that over-tourism presents? What are some solutions proposed by Jim Lutz, president of the tourism company Vaya Adventures? Lutz states that he wants only tourists interested in a certain type of tourism to visit the islands. What tourism does he encourage? What type of tourism does he want to keep away? Do you think it would be possible to implement this restriction? Do you think it would be effective?
6. With a partner, discuss the frustrations local fishers had with foreign biologists and conservation rules. Can you sympathize with their point of view? Is one side of the argument more compelling to you than the other?
7. Now that you have almost finished the book, what kind of geographical imagination do you have of the Galápagos Islands? In a group, draw a map of the Galápagos on a large sheet of paper. Be creative – you can include pictographs that symbolize plants, animals, and people. If needed, consult the maps at the beginning of the book.
8. Design a tourism brochure and trip itinerary to show the human aspect of the Galápagos. What would you include? What would you have tour guides explain?

CHAPTER 8: ALL THE WAY DOWN

Questions

1. Darwin studied the environment and the species on the Galápagos, but not the human populations. Why is it important to consider the role of humans in the environment and conservation?
2. Look back at conservationists' visions for the Galápagos in the 1950s and early 1960s discussed in Chapter 5. What that they imagined has happened? What has not? What lessons can you take from this for planning future conservation efforts?
3. How has the relationship between conservationists and the residents of the Galápagos changed over time? Where does it stand now?
4. In how many ways have tortoises been treated as commodities? Why were they regarded in these ways, and with what consequences?
5. After finishing the book, how would you explain the meaning of the turtle-stacking metaphor? What examples and evidence can be garnered to support your interpretation of the metaphor?
6. Do you believe the Galápagos Islands should be characterized as an "evolutionary Eden" or a natural laboratory? If so, how? If not, how would you characterize the Galápagos in terms of their history and conservation?
7. In the Galápagos, the lives of humans and endangered species exist together in close proximity, and have become intertwined. What challenges does this present to endangered species? To humans? How can these two groups effectively coexist? What do they have to offer each other?
8. Are ecotourism and conservation mutually beneficial or contradictory goals? Knowing what you know now about ecotourism on the Galápagos and how it has shaped government positions, local economy, conservation studies, and quality of life on the islands, discuss the paradox of ecotourism. Compare the Galápagos case to ecotourism in other regions.
9. Think about examples of colonization from history. How can colonization be understood as a metaphor for species arrivals, agricultural colonies, mid-twentieth century environmentalists, new migrants recently, and "colono" identity?

CHAPTER 8: ALL THE WAY DOWN

10. Hennessy argues that environmental justice is social justice. What does she mean by this? How would a focus on multi-species environmental justice change conservation practices in the Galápagos? How could this focus change conservation efforts closer to home?

Activities

1. How did approaches to conservation change over time in the Galápagos? Create a timeline with major milestones in Galápagos conservation efforts.
2. On notecards, have each student write down a question they have or a question posed in the book that deserves more attention or discussion. Have each student pass their notecard to the person to their left and write a response to the question on the notecard they receive. Continue for a few rounds, limiting each round to a minute or two. Discuss as a class.
3. Host a classroom debate based on this statement: “The natural laboratory model is ideal for conservation of the Galápagos.”
4. Read the article, “[‘Extinct’ Galápagos tortoise found after 100 years.](#)” What does the reemergence of the tortoise on Fernandina mean for the islands? What steps would you take as a conservationist on the Galápagos to foster the growth of the rebounding species? Would you? What problems would you expect to run into?
5. Imagine that you are Lonesome George. Write a journal entry depicting your thoughts on a daily basis. Separate the class into three groups. The first group will write about George’s life before he was put in captivity. The second group will write about George’s life in captivity at the breeding center. The third group will write about George at the end of his life in captivity. What are you (Lonesome George) thinking about? As a charismatic conservation icon, George was meant to communicate a story to tourists. What are the ethics and politics of this kind of anthropomorphism, or cross-species empathy?
6. Revisit the design of your ideal natural laboratory activity from Chapter 1. Have your ideas changed? How and why?